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EXAMINER  
STEVENS, G

ART UNIT PAPER NUMBER

9

2411

DATE MAILED: 09/17/96

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24M1/0917

This is a communication from the examiner in charge of your application.  
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☒ Responsive to communication filed on 10/11/94 ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), 0 days from the date of this letter.  
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

**Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:**

- ☒ Notice of References Cited by Examiner, PTO-892.
- ☒ Notice of Draftsman's Patent Drawing Review, PTO-948.
- ☒ Notice of Art Cited by Applicant, PTO-1449.
- ☐ Notice of Informal Patent Application, PTO-152.
- ☐ Information on How to Effect Drawing Changes, PTO-1474.
- ☐

**Part II SUMMARY OF ACTION**

- ☒ Claims 1-18 are pending in the application.  
Of the above, claims \_\_\_\_\_ are withdrawn from consideration.
- ☐ Claims \_\_\_\_\_ have been cancelled.
- ☐ Claims \_\_\_\_\_ are allowed.
- ☒ Claims 1-18 are rejected.
- ☐ Claims \_\_\_\_\_ are objected to.
- ☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.
- ☐ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
- ☐ Formal drawings are required in response to this Office action.
- ☐ The corrected or substitute drawings have been received on \_\_\_\_\_. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice of Draftsman's Patent Drawing Review, PTO-948).
- ☐ The proposed additional or substitute sheet(s) of drawings, filed on \_\_\_\_\_, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
- ☐ The proposed drawing correction, filed \_\_\_\_\_, has been ☐ approved; ☐ disapproved (see explanation).
- ☐ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received ☐ not been received ☐ been filed in parent application, serial no. \_\_\_\_\_; filed on \_\_\_\_\_.
- ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
- ☐ Other

**EXAMINER'S ACTION**

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### **Part III DETAILED ACTION**

1. The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

2. Regarding claim 1, Syswerda teaches of a method for scheduling an activity (See Syswerda, Abstract) that uses consumable resources (See Syswerda; column 4, lines 12-19) and is governed by a set of predefined constraints (See Syswerda; abstract; column 1 line 68 through column 2, line 4). An initial schedule is created through the random assignment of tasks (See Syswerda; column 2, lines 39-40). The schedule is then evaluated and scored in order to obtain a ranking (See Syswerda; column 2, lines 42-45). Through the use of crossover and mutation operators new schedules are generated (See Syswerda; column 4, lines 59-63). Legal schedules are created that meet all hard constraints and scoring is accomplished using weighted values for soft constraints (See Syswerda; column 2, lines 26-28). Schedules that are scored highly have a higher likelihood of being chosen for participation in the operation than a relatively low scoring schedule. However, random selection is also used to ensure complete evaluation of the

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decision space (See Syswerda; column 4, line 68 through column 5, line 5). The process is repeated and a listing of ranked schedules is generated from highest to lowest (See Syswerda; claim 1).

Syswerda does not teach of repairing constraint violations. All hard constraints are strictly meet to generate legal schedules. The evaluation of the soft constraints and whether they are violated along with their associated weights are used to establish scores for each schedule.

Tanaka teaches of selectively relaxing violated constraints in order to generate a legal schedule (See Tanaka, abstract). The examiner respectively asserts that constraint relaxation is one method of constraint violation repair which would fall within the boundaries of the claims as presently drafted.

The motivation to modify the teachings of the primary reference, Syswerda, with that of the secondary reference, Tanaka, comes directly from the secondary reference. In the real world of manufacturing, not all constraints need to always be strictly satisfied. In a production scheduling problem. On a factory floor, machine usage is normally flexible to some extent, and can be changed more or less depending on conditions. In this manner, in an actual constraint satisfaction problem, constraints can be relaxed to widen a "solution space" or "a set of candidate solutions". In this manner the probability of finding an optimal production schedule is increased and the commensurate savings due to increased efficiency is realized.

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Therefore, claim 1 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

3. As per claim 2, Syswerda teaches that schedules which are scored highly have a higher likelihood of being chosen for participation in the operation than a relatively low scoring schedule (See Syswerda; column 4, line 68 through column 5, line 5).

Therefore, claim 2 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

4. As per claim 3, schedules which score highly have a better chance of making the list. However, random selection is also used to ensure complete evaluation of the decision space (See Syswerda; column 4, line 68 through column 5, line 5). The examiner asserts that this would cause the worst scoring schedule to occasionally be selected for list inclusion.

Therefore, claim 3 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

5. As per claim 4, Syswerda does not per se select the last schedule as the final schedule which in the present application would be the highest scored schedule. However, Syswerda does supply an ordered list of schedules in ranked order. It would have been obvious to one of ordinary skill in the art to select the highest ranked schedule as the final schedule. Otherwise, a less than optimum schedule would be used to produce a product.

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Therefore, claim 4 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

6. As per claims 5 and 13, Syswerda does not teach storing the best scoring schedule or the list of ranked schedules. The examiner asserts that it is well known in the art to store the results of computations. The motivation to do so is to allow for later retrieval and review.

Therefore, claims 5 and 13 are rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

7. As per claim 6, Syswerda teaches that tasks and their associated constraints are given different priorities. When a task is placed into the schedule but it has a soft constraint violation then only half of its priority is added to the schedules score (See Syswerda; column 4, lines 34-49). The degree of violation of the constraint is not addressed by Syswerda. However, Tanaka teaches that constraints may be relaxed to enable the creation of a legal schedule. To accomplish this Tanaka use a knowledge base to determine the possibility and degree of relaxation possible (See Tanaka; column 3, lines 1-6).

The motivation to modify the primary reference with the teachings of the secondary reference has been previously supplied under claim 1 and is incorporated her by reference.

Therefore, claim 6 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

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8. As per claim 7, Syswerda teaches that tasks and their associated constraints are given different priorities. When a task is placed into the schedule but it has a soft constraint violation then only half of its priority is added to the schedules score (See Syswerda; column 4, lines 34-49). The degree of violation of the constraint is not addressed by Syswerda. However, Tanaka teaches that constraints may be relaxed to enable the creation of a legal schedule. To accomplish this Tanaka use a knowledge base to determine the possibility and degree of relaxation possible (See Tanaka; column 3, lines 1-6).

The motivation to modify the primary reference with the teachings of the secondary reference has been previously supplied under claim 1 and is incorporated her by reference.

Therefore, claim 7 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

9. Regarding claim 8, Syswerda does not teach of repairing constraint violations. Tanaka teaches of selectively relaxing violated constraints in order to generate a legal schedule (See Tanaka, abstract). The examiner respectively asserts that constraint relaxation is one method of constraint violation repair which would fall within the boundaries of the claims as presently drafted. After relaxation under the Tanaka invention the constraint violation would be less severe since there would probably be no constraint violation.

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The applicant is directed to claim 1 for the motivation to modify the teachings of the primary with the teachings of the secondary reference.

Therefore, claim 8 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

10. Regarding claim 9, neither Syswerda nor Tanaka teach of requiring a schedule to surpass a predetermined threshold score. However, Syswerda supplies a ranked listing of scored schedules and the examiner asserts that the user may select any schedule from the list which exceeds a threshold score.

Therefore, claim 9 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

11. Regarding claims 10, 11, 17 and 18, neither Syswerda nor Tanaka teach that resources are inventory or materials used in maintenance and repair operations. However, Syswerda teaches that resources may be selected from a predetermined pool of resources (See Syswerda; column 4, lines 12-19). The examiner asserts that inventory and parts used for maintenance and repair are resources which can be retrieved from a pool of resources (See Syswerda; column 1, lines 62-66).

Therefore, claims 10, 11, 17 and 18 are rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

12. As per claim 12, Syswerda teaches of a method for scheduling an activity (See Syswerda, Abstract) that is governed by a set of predefined constraints (See Syswerda; abstract; column 1 line 68 through column 2, line 4). An initial schedule is created

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through the random assignment of tasks (See Syswerda; column 2, lines 39-40). The schedule is then evaluated and scored in order to obtain a ranking (See Syswerda; column 2, lines 42-45). The scoring function is accomplished by evaluating tasks accomplished and the constraints violated (See Syswerda; column 4, lines 33-49). All constraints have descriptive information stored identifying them as either soft or hard constraints (See Syswerda; column 2, lines 23-29). Through the use of crossover and mutation operators new schedules are generated (See Syswerda; column 4, lines 59-63). Legal schedules are created that meet all hard constraints and scoring is accomplished using weighted values for soft constraints (See Syswerda; column 2, lines 26-28). Schedules that are scored highly have a higher likelihood of being chosen for participation in the operation than a relatively low scoring schedule. However, random selection is also used to ensure complete evaluation of the decision space (See Syswerda; column 4, line 68 through column 5, line 5). The process is repeated and a listing of ranked schedules is generated from highest to lowest (See Syswerda; claim 1).

Syswerda does not teach of repairing constraint violations and thereby generating new schedules for comparison to earlier generated schedules scores.

Tanaka teaches of selectively relaxing violated constraints in order to generate a legal schedule (See Tanaka, abstract). The examiner respectively asserts that constraint relaxation is one method of constraint violation repair which would fall within the boundaries of the claims as presently drafted.



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The applicant is directed to claim 1 for the motivation for modifying the teachings of the primary reference with that of the secondary reference.

Therefore, claim 12 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

**13.** As per claim 14, all constraints have descriptive information stored identifying them as either soft or hard constraints (See Syswerda; column 2, lines 23-29). Tasks and their associated constraints are weighted through a priority function (See Syswerda; column 4, lines 1-5).

Syswerda does not teach of providing descriptions of constraints or repairing constraints using a method specific to the constraint.

Tanaka teaches that each constraint has an associated knowledge source which indicates whether the constraint may be relaxed and the degree by which it is relaxed. In addition, when such information is absent then the system may turn to an external source (See Tanaka; column 3, lines 1-12). The examiner asserts that it would be necessary to identify in a descriptive manner the constraint to the external source for the external source to be able to supply information on relaxing the constraint.

The applicant is directed to claim 1 for the motivation for modifying the teachings of the primary reference with that of the secondary reference.

Therefore, claim 14 is rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

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14. As per claims 15 and 16, the examiner asserts that the use of an input device and display are well known in the art.

Therefore, claims 15 and 16 are rejected under 35 U.S.C. § 103 as being unpatentable over Syswerda in view of Tanaka.

15. Any Inquiry concerning this communication or earlier communications from the examiner should be directed to George N. Stevens whose telephone number is (703) 308-7563 from 8 AM to 4:30 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gail Hayes, can be reached at (703) 305-9711. The fax number for this group is (703) 305-9731.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 305-3800.

GNS: September 14, 1996



GAIL O. HAYES  
SUPERVISORY PATENT EXAMINER  
GROUP 2400